Name: ____________________ Date: ____________

Polynomial Operations SOLUTION (version 151)

1. Let polynomials $p(x)$ and $q(x)$ be defined below.

$$p(x) = -x^5 + 4x^4 + 8x^2 - 3x + 10$$

$$q(x) = 2x^5 - 6x^3 - 5x^2 + 4x + 1$$

Express the sum of $p(x) + q(x)$ in standard form.

Get "unsimplified" forms. Then find $p(x) + q(x)$ with addition/subtraction.

$$p(x) = (-1)x^5 + (4)x^4 + (0)x^3 + (8)x^2 + (-3)x^1 + (10)x^0$$
$$q(x) = (2)x^5 + (0)x^4 + (-6)x^3 + (-5)x^2 + (4)x^1 + (1)x^0$$
$$p(x) + q(x) = (1)x^5 + (4)x^4 + (-6)x^3 + (3)x^2 + (1)x^1 + (11)x^0$$
$$p(x) + q(x) = x^5 + 4x^4 - 6x^3 + 3x^2 + x + 11$$

2. Let polynomials $a(x)$ and $b(x)$ be defined below.

$$a(x) = 7x^2 + 5x + 4$$

$$b(x) = 3x - 5$$

Express the product $a(x) \cdot b(x)$ in standard form.

You can use a table for multiplication.

*	$7x^2$	$5x$	4
$3x$	$21x^3$	$15x^2$	$12x$
-5	$-35x^2$	$-25x$	-20

$$a(x) \cdot b(x) = 21x^3 + 15x^2 - 35x^2 + 12x - 25x - 20$$

Combine like terms.

$$a(x) \cdot b(x) = 21x^3 - 20x^2 - 13x - 20$$

3. Express $(x + 1)^5$ in standard (expanded) form.

Remember the binomial theorem. It tells us to use Pascal's triangle.

$$x^5 + 5x^4 + 10x^3 + 10x^2 + 5x + 1$$

Polynomial Operations SOLUTION (version 151)

4. Let polynomials $f(x)$ and $g(x)$ be defined below.

$$\begin{aligned} f(x) &= -2x^3 + 15x^2 - 6x + 1 \\ g(x) &= x - 7 \end{aligned}$$

The quotient of $\frac{f(x)}{g(x)}$ can be expressed as a polynomial, $h(x)$, and a remainder, R (a real number).

$$\frac{f(x)}{g(x)} = h(x) + \frac{R}{x-7}$$

By using synthetic division or long division, express $h(x)$ in standard form, and find the remainder R.

I prefer using synthetic division.

$$\begin{array}{r|rrrr} & -2 & 15 & -6 & 1 \\ 7 & & -14 & 7 & 7 \\ \hline & -2 & 1 & 1 & 8 \end{array}$$

So,

$$\frac{f(x)}{g(x)} = -2x^2 + x + 1 + \frac{8}{x-7}$$

In other words, $h(x) = -2x^2 + x + 1$ and the remainder is $R = 8$.

5. Let polynomial $f(x)$ still be defined as $f(x) = -2x^3 + 15x^2 - 6x + 1$. Evaluate $f(7)$.

You could do this the hard way.

$$\begin{aligned} f(7) &= (-2) \cdot (7)^3 + (15) \cdot (7)^2 + (-6) \cdot (7) + (1) \\ &= (-2) \cdot (343) + (15) \cdot (49) + (-6) \cdot (7) + (1) \\ &= (-686) + (735) + (-42) + (1) \\ &= 8 \end{aligned}$$

Or, if you reference the polynomial remainder theorem, you can state that you know $f(7)$ equals the remainder when $f(x)$ is divided by $x - 7$. Thus, $f(7) = 8$.